UNITED STATES DISTRICT COURT
FOR THE DISTRICT OF MASSACHUSETTS

MASSACHUSETTS INSTITUTE OF TECHNOLOGY, and CHILDREN'S MEDICAL CENTER CORPORATION, *Plaintiffs/ Counterclaim Defendants*, v. SHIRE PHARMACEUTICALS, INC., and SHIRE REGENERATIVE MEDICINE, INC., *Defendants/ Counterclaim Plaintiffs*	Civil Action No. 13-cv-10020-MLW

DEFENDANTS' SUPPLEMENTAL MEMORANDA
UNDER PARAGRAPH 1 OF ECF NO. 119

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I. INTRODUCTION

As per the Court's Order (ECF No. 119), Defendants Shire Pharmaceuticals LLC and Shire Regenerative Medicine, Inc. provide this supplemental memoranda to address three issues identified by the Court concerning the claim construction inquiry and Markman hearing in the instant case. This supplemental briefing supports Defendants' claim construction arguments as presented in ECF No. 77, Defendants' Preliminary Claim Construction Brief ("Defs. Pre. Brief") and ECF No. 87, Defendants' Reply Claim Construction Brief ("Defs. Reply Brief").

The first issue concerns whether the Court should decide indefiniteness in connection with the *Markman* hearing. In addition to providing the law on this point, Defendants also explain the standard for determining indefiniteness under a recent Supreme Court decision and address how cases subsequently decided have applied the new indefiniteness standard. Under this rubric, Defendants explain why the terms "three-dimensional" and "fibrous" are indefinite.

The second issue asks for the standards for determining whether examples or statements in the patent specifications limit the scope of a claim. Further, Defendants apply these standards to various disputed claim terms to demonstrate that such terms should be limited in scope based upon the disclaimers/disavowals in the patent specifications.

As to the third issue, Defendants provide the Court with the law supporting the use of expert testimony in the claim construction inquiry, and demonstrate why such extrinsic evidence would be beneficial to the Court in this particular case. Defendants also summarize why recent Supreme Court law does not significantly impact the use of experts in a *Markman* hearing. Finally, Defendants include information regarding the background of Dr. Stephen F. Badylak, an expert in the field of tissue engineering and regenerative medicine, and describe how he is uniquely qualified to explain how a person of ordinary skill in the art ("POSA") would interpret

the claims of U.S. Patent Nos. 5,770,193 (Ex.1[1], the "'193 patent"), 5,759,830 (Ex.2, the "'830 patent"), and 5,770,417 (Ex.3, the "'417 patent") (collectively the "Patents in Suit").

II. INDEFINITENESS, ITS PLACE IN CLAIM CONSTRUCTION, AND THE MERITS OF DEFENDANTS' INDEFINITENESS DEFENESE

As per the Court's Order (ECF No. 119, ¶ 1a), Defendants address herein (i) whether the Court should decide the indefiniteness issue in connection with the *Markman* hearing or after discovery, (ii) the standards for deciding indefiniteness after *Nautilus, Inc. v. Biosig Instruments, Inc.*, 134 S. Ct. 2120 (2014), and any progeny, and (iii) the merits of Defendants' indefiniteness defense.

A. Indefiniteness Under *Nautilus* and the *Nautilus* Progeny

1. The Indefiniteness Standard Under *Nautilus*

Indefiniteness is determined as of the filing date of the patent application. *Nautilus*, 134 S. Ct. at 2130; s*ee also Phillips v. AWH Corp.*, 415 F.3d 1303, 1313 (Fed. Cir. 2005) (en banc) ("[T]he ordinary and customary meaning of a claim term is the meaning that the term would have to a person of ordinary skill in the art in question at the time of the invention, i.e., as of the effective filing date of the patent application."). Under *Nautilus*, "a patent is invalid for indefiniteness if its claims, read in light of the specification delineating the patent, and the prosecution history, fail to inform, with reasonable certainty, those skilled in the art about the scope of the invention." 134 S. Ct. at 2124.

In rejecting the Federal Circuit's permissive view toward ambiguous patent claims (i.e., finding indefiniteness only if a claim was "not amenable to construction" or "insolubly ambiguous," *id.* at 2130 n.9), the Supreme Court explained that "[t]o tolerate imprecision just short of that rendering a claim 'insolubly ambiguous'" is unacceptable. *Id.* at 2130. Therefore,

[1] "Ex.__" herein refers to the September 12, 2014 Declaration of Jonathan A. Herstoff (ECF No. 77-1 for Exhibits 1-78), and to the September 30, 2014 Declaration of Jonathan A. Herstoff (ECF No. 87-1 for Exhibits 79-82).

the mere fact that a court "can ascribe *some* meaning to a patent's claims" does not save the claims from indefiniteness. *Id.* (emphasis in original).

Although *Nautilus* left this question "for another day," *id.* at 2130 n.10, the Federal Circuit has held that indefiniteness must be proven by clear and convincing evidence. *See, e.g., Warsaw Orthopedic, Inc. v. NuVasive, Inc.*, Nos. 2013-1576, 2013-1577, ---F.3d---, 2015 WL 859503, at *3 (Fed. Cir. Mar. 2, 2015).

2. Indefiniteness Decisions after *Nautilus*

Since *Nautilus*, the Federal Circuit and district courts have addressed indefiniteness under the new standard. In particular, the Federal Circuit has explained that "[a]lthough absolute or mathematical precision is not required, it is not enough, as some of the language in [the Federal Circuit's] prior cases may have suggested, to identify *some standard* for measuring the scope of the phrase." *Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364, 1370-71 (Fed. Cir. 2014) (emphasis in original, internal quotation marks omitted). Moreover, "[e]ven if a claim term's definition can be reduced to words, the claim is still indefinite if a person of ordinary skill in the art cannot translate the definition into meaningfully precise claim scope." *Id.* at 1371 (quoting *Halliburton Energy Servs., Inc. v. M-I LLC*, 514 F.3d 1244, 1251 (Fed. Cir. 2008)). Further, at least one district court has found indefiniteness where "[the] claims all have some meaning and are not insolubly ambiguous, but they do fall short of the new, more rigorous reasonable certainty standard for indefiniteness." *Abdou v. Alphatec Spine, Inc.*, No. 12-CV-1804, 2014 WL 6611422, at *10 (S.D. Cal. Nov. 19, 2014). In particular, in *Abdou* the Court noted that although the claims, directed to a medical device, required that "the surgical site be accurately targeted and that the mount, anchor device, or fixation member be positioned to limit movement[,]" and that "the entirety of the apparatus must be in an operating room[,]" this guidance from the claims was insufficient to meet the definiteness standard articulated in *Nautilus* for the claim terms

"defined anatomical position," "defined anatomical relationship," and "defined spatial relationship." *Id.* at *9. As another example, in *Regeneron Pharmaceuticals, Inc. v. Merus B.V.*, No. 14 Civ. 1650(KBF), 2014 WL 6611510 (S.D.N.Y. Nov. 21, 2014), the Court found the term "endogenous mouse immunoglobulin locus" to be indefinite where as of the filing date, *inter alia*, a POSA would not have known with reasonable certainty where the locus was, and such information was not provided in the patent. 2014 WL 6611510, at *23-24.

B. Indefiniteness Is Properly Decided During Claim-Construction Proceedings

"Indefiniteness is a matter of claim construction." *Praxair, Inc. v. ATMI, Inc.*, 543 F.3d 1306, 1319 (Fed. Cir. 2008); *accord ePlus, Inc. v. Lawson Software, Inc.*, 700 F.3d 509, 517 (Fed. Cir. 2012) ("[I]ndefiniteness is a question of law and in effect part of claim construction."). Accordingly, "courts commonly rule on any asserted claim indefiniteness when they construe patent claims." *Am. Med. Sys., Inc. v. Biolitec, Inc.*, 666 F. Supp. 2d 216, 223 (D. Mass. 2009) (Ponsor, J.) (citing *Atmel Corp. v. Info. Storage Devices, Inc.*, 198 F.3d 1374, 1378 (Fed. Cir. 1999) ("A determination of claim indefiniteness is a legal conclusion that is drawn from the court's performance of its duty as the construer of patent claims.")).

Since *Nautilus*, it remains proper to decide the issue of indefiniteness during claim-construction proceedings. For instance, in *Interval Licensing LLC v. AOL, Inc.*, 766 F.3d 1364 (Fed. Cir. 2014), the Federal Circuit affirmed a finding of indefiniteness that was made during claim-construction proceedings. 766 F.3d at 1368-74. Additionally, in *Regeneron* the district court rejected the notion that indefiniteness should be decided later in the litigation, and instead decided the question of indefiniteness as part of claim-construction proceedings. 2014 WL 6611510, at *24. In particular, it explained that

> [the argument that] questions of indefiniteness should await a later stage of the proceedings—and not be resolved as a part of claim construction . . . . asks [the] Court to either arrive at a construction

> for a term which is indefinite—or to ignore its responsibilities during claim construction. It will do neither. If during claim construction, it becomes clear that a claim cannot in fact be construed due to indefiniteness, there is no legal principle for the Court to withhold its determination on that issue.

Id. at n.21 (citing *Teva Pharm. USA, Inc. v. Sandoz, Inc.*, 723 F.3d 1363, 1367-69 (Fed. Cir. 2013)); *see also Kroy IP Holdings, L.L.C. v. Autozone, Inc.*, No. 2:13-CV-888-WCB, 2014 WL 7336234, at *15 (E.D. Tex. Dec. 23, 2014) (Bryson, J., sitting by designation) ("Raising the issue of indefiniteness in the course of claim construction proceedings is appropriate. As the Federal Circuit has explained, 'indefiniteness is a question of law and in effect part of claim construction.'" (quoting *ePlus*, 700 F.3d at 517)).

As explained in detail in Defendants' Preliminary and Reply Claim Construction briefs, as well as in the supporting declarations, the intrinsic record makes plain that the terms "three-dimensional" and "fibrous" do not inform a POSA, with reasonable certainty, about the scope of the invention. (*See* Defs. Pre. Brief at 18-23; Defs. Reply Brief at 9-13; Ex.19, Badylak Dec. ¶¶ 104-114,119-128; Ex.79, Badylak Reply Dec. ¶¶ 8-17, 49-52). The Court should therefore rule on indefiniteness at the claim-construction stage. *See Brandywine Commc'ns Techs., LLC v. AT & T Corp.*, No. C 12-2494, 2014 WL 1569544, at *13 (N.D. Cal. Apr. 18, 2014) (ruling on indefiniteness during claim construction where there were no factual disputes to preclude the court from finding a claim indefinite).

C. Defendants Have Shown by Clear and Convincing Evidence that the Terms "three dimensional" and "fibrous" Cannot Be Construed with Reasonable Certainty and Are Therefore Indefinite

Because the Patents in Suit and the corresponding prosecution histories would not have informed a POSA of the meaning of "three-dimensional" and "fibrous" with reasonable certainty, these terms are indefinite. (*See* Defs. Pre. Brief at 6, 18-23; Defs. Reply Brief at 9-13; Ex.19, Badylak Dec. ¶¶ 104-114, 119-128; Ex.79, Badylak Reply Dec. ¶¶ 8-17, 49-52).

1. "three-dimensional"

At the time of the filing of the Patents in Suit, tissue engineering was a nascent field, and cell-culture technology was evolving. (*See* Ex.19, Badylak Dec. ¶ 109). Add to that Plaintiffs' characterization of the Patents in Suit as "pioneering patents in the field of artificial tissue generation" that describe "ground-breaking" technology. (Plaintiffs' Opening Brief at 1). Hence, at the time of the invention, terms having their genesis in the fields of tissue engineering and regenerative medicine needed clear explanation, given that no plain and ordinary meanings likely existed, and such terms may be defined differently depending upon their context.

a. There was no standard definition for the term "three dimensional," and the intrinsic record provides no reasonably certain interpretation of the term

In all of the materials and briefing submitted to date in this case, neither Plaintiffs nor Defendants have provided the Court with a definition of "three-dimensional" from a scientific/medical dictionary or treatise from the 1986-89 timeframe. That is because such a definition did not exist; there was no adopted definition for the term "three-dimensional" in the context of cell culture. (*See* Defs. Pre. Brief at 21; Ex.19, Badylak Dec. ¶ 109). A POSA, however, would have had some familiarity with the concept of "three-dimensional," that being "growing cells on and within a structure in an attempt to mimic the natural environment of the cell." (*See id.*). But because of the infancy of the disciplines of tissue engineering and regenerative medicine, as well as the evolving art of cell culture, a POSA would have required some guidance in order to have reasonable certainty as to the meaning of "three-dimensional" in any given context in the mid-1980s. (*See id.*).

Regarding the Patents in Suit, the intrinsic evidence would not have helped a POSA determine the meaning of the term "three-dimensional." (*See* Defs. Pre. Brief at 21-22; Ex.19, Badylak Dec. ¶ 109-110). First, the patents do not describe—let alone define—"three-

dimensional." Although the patents make fleeting references to the term "three-dimensional," they are never done in the context of a "scaffold" as claimed in the patents. (*See* Defs. Pre. Brief at 21; Ex.19, Badylak Dec. ¶ 110). Additionally, throughout the twelve years of prosecution, applicants never clarified what was meant by a "three-dimensional" scaffold. (*See* Defs. Pre. Brief at 22-23; Ex.19, Badylak Dec. ¶ 112).

In sum, the intrinsic record provides no guidance, let alone a reasonably certain meaning, as to the term "three-dimensional" in the context of the Patents in Suit. And, just as the *Regeneron* court found the term "endogenous mouse immunoglobulin locus" indefinite when the characteristics of the immunoglobulin locus were undefined at the time of the invention and the intrinsic record provided no clarification (*see* 2014 WL 6611510, at *23), so should this Court find "three-dimensional" indefinite because its characteristics were not established in the 1980s and the intrinsic record adds nothing to the inquiry.

b. Plaintiffs' Proposed Construction is Unsupported and Untenable

Plaintiffs' proposed construction of "three-dimensional"—"capable of having cells attach in substantially different planes"[2]—is unsupported and untenable based upon the evidence in the record. As an initial matter, it is unclear how the term "substantially" qualifies the word "different" in Plaintiffs' construction. (*See* Defs. Pre. Brief at 21; *see also* Ex.19, Badylak Dec. ¶ 108.) More specifically, it is unclear whether the term "substantially different" means "essentially different" or "very different" when determining how different the planes need to be in order to be "three-dimensional." As a result, Plaintiffs' definition of "three-dimensional" does not save the claim from indefiniteness. *See Interval* at 766 F.3d 1370-71 (Fed. Cir. 2014) (noting

[2] The parties agree on the construction of the term "scaffold," and therefore the dispute is over the term "three-dimensional." Plaintiffs never expressly defined "three-dimensional," but based on Plaintiffs' definition for "three-dimensional scaffold," Defendants presume that Plaintiffs' construction for "three-dimensional" is "capable of having cells attach in substantially different planes."

that "the claim is still indefinite if a person of ordinary skill in the art cannot translate the definition into meaningfully precise claim scope.").

In addition, Plaintiffs' proposed definition is unsupported by the intrinsic record, as well as the extrinsic evidence identified by Plaintiffs. The language in Plaintiffs' construction, namely "cells can attach in substantially different planes," is not found in the Patents in Suit or in the numerous and extensive exchanges between the Examiner and applicants during prosecution. The best that Plaintiffs can do to support their proposed definition of "three-dimensional scaffold" is to point to U.S. Patent No. 4,963,489 ("'489 patent"), which Plaintiffs allege "uses" the term three-dimensional "in a very similar way" as their proposed construction. (*See* Plaintiffs' Opening Brief at 11). But Plaintiffs' proposed definition for "three-dimensional" scaffold and the definition of "three-dimensional matrix" in the '489 patent are different. The '489 patent expressly defines "three-dimensional matrix" as a matrix "that allows cells to grow in more than one layer." (*See* Ex.81, '489 patent, col.3 ll.53-58). All Plaintiffs can say is that this definition "**is similar to the concept** of allowing attachment in more than one plane." (Plaintiffs' Opening Brief at 11) (emphasis added). But a POSA would not interpret cells attaching in more than one layer to be the same as attaching in different planes. (*See* Defs. Reply Brief at 11; *see also* Ex.79, Badylak Reply Dec. ¶ 11). In sum, Plaintiffs provide no tenable basis for their proposed construction of "three-dimensional scaffold."

c. Scaffolds that are three-dimensional under Plaintiffs' proposed definition are characterized as two-dimensional in the intrinsic record

Although the Patents in Suit do not explain what is meant by "three-dimensional" in terms of cell culturing, the '830 patent does discuss in one instance the term "two-dimensional" in this context. The '830 patent states:

> The concept of uniform ***cell seeding*** of a collagen gel is therefore biologically limited by diffusion distance constraints. One would expect that an implant of less than 1 cm^3 would result in ***cell viability at the periphery of the implant to a depth of 3-5 mm***. However, the cells in the center of the implant would not remain viable because of limitation of nutrition, diffusion, as well as gas exchange. One can envision large flat ***gels with very small thicknesses of 5-10 mm*** would allow larger implants to occur. However, ***this two dimensional solution*** may have geometric constraints for implantation.

(Ex.2, '830 patent, col.24 ll.1-11) (emphasis added). This passage shows that Plaintiffs' proposed construction of "three-dimensional" cannot be correct. In particular, if after cell seeding of a collagen gel, cells can be viable at a depth of 3-5 mm, this means that the gels contain cells in different planes at least up to a depth of 3-5 mm. (Ex.19, Badylak Dec. ¶ 111.) Thus, it appears that these gels would meet Plaintiffs' construction of "three-dimensional." Yet the '830 patent identifies such gels as "two-dimensional." As such, although the Patents in Suit do not assist in determining the proper construction for "three-dimensional," the '830 patent demonstrates that Plaintiffs' proposed construction cannot be correct.

The prosecution histories confirm the indefiniteness of the term "three-dimensional" and the incongruity of Plaintiffs' proposed definition. (Defs. Pre. Brief at 22-23; Ex.19, Badylak Dec. ¶¶ 112-113.) In particular, applicants made the following statement during prosecution:

> The work done by Drs. Burke and Green, and ***Dr. Yannas (who's [sic] patent has been cited against the claims)***, was also discussed at the interview by Dr. Vacanti. He knows these people and is familiar with their work, and is of the same opinion as Dr. Donaho, that ***the prior work relates to the use of "two-dimensional" structures***, not three-dimensional structures that can be used to make functional organ replacements.

(Ex.54, '830 PH 6/90 Resp., at SHR0004587; Ex.52, '193 PH 6/90 Resp., at SHR0000192) (emphasis added). Given that at the time these statements were made, applicants' claims were faced with rejections based upon prior-art U.S. Patent No. 4,458,678 ("Yannas '678"), a POSA

would have understood "[t]he work done by . . . Dr. Yannas" to include the technology described in Yannas '678. (Ex.19, Badylak Dec. ¶¶ 113). Put differently, applicants were saying that Yannas '678, *inter alia*, discloses two-dimensional structures, in contrast to applicants' three-dimensional structures to make the organ replacements of the invention. But Yannas '678 is directed to "the introduction of cells into a fibrous lattice," and discloses that the cells "become *enmeshed in the fibers of the lattice*, and are thereby retained upon or *within the lattice*." (Ex.57, '678 patent, col.4 ll.60-61, col.9 ll.44-46) (emphasis added). Thus, Yannas '678 discloses a lattice that contains cells in different planes—fitting what appears to be Plaintiffs' proposed construction of "three-dimensional." Yet applicants described Yannas '678 as being directed to "two-dimensional" structures. Accordingly, although the prosecution histories make clear that Plaintiffs' proposed construction cannot be correct, nothing therein elucidates a construction that *is* correct.

Even though a POSA would have had the general understanding, in 1986, that in certain contexts "three-dimensional" refers to growing cells on and within a structure, the intrinsic record would disabuse the POSA from the idea that this understanding could be applied in the context of the Patents in Suit. The collagen gels in the '830 patent with cells 3-5 mm in depth, and the fibrous lattice in Yannas '678 with cells enmeshed (within) the fibrous lattice, would be considered "three-dimensional" by a POSA when applying this general understanding. But this would be inconsistent with the applicants' characterization of these gels and lattices as "two-dimensional." Thus, a POSA would have known that the general understanding could not be applied to the term "three-dimensional" as it is used in the claims.

In sum, the Patents in Suit and their corresponding prosecution histories would not have informed a POSA, with reasonable certainty, of the meaning of "three-dimensional." Therefore, "three-dimensional" is indefinite.

2. "fibrous"

A POSA would not have understood the meaning of "fibrous" with reasonable certainty in the context of the Patents in Suit. Thus, "fibrous" is indefinite. (*See* Defs. Pre. Brief at 18-19; *See* Ex.19, Badylak Dec. ¶¶ 122-128).

First, the claims themselves do not provide a meaning for "fibrous." The independent claims in each of the Patents in Suit require a three-dimensional scaffold that is "fibrous," whereas dependent claims 5 and 6 of the '830 patent recite members of the fibers that are "fibrous." Thus, the claims would have only informed a POSA that "scaffolds" and "members" can both be "fibrous," but they shed no light on the meaning of "fibrous." *Id.* ¶ 122. At most, the claims would have demonstrated to a POSA that "fibrous" cannot simply mean "containing, consisting of, or resembling fibers," the meaning set forth by Plaintiffs. (*See* Plaintiffs' Opening Brief at 21). Such a construction would render superfluous the term "composed of fibers"—which is recited in each of the independent claims in the context of "a fibrous three-dimensional scaffold composed of fibers." (*See* Defs. Pre. Brief at 18; Ex.19, Badylak Dec. ¶ 123; *see also Merck & Co. v. Teva Pharms. USA, Inc.*, 395 F.3d 1364, 1372 (Fed. Cir. 2005) (rejecting a construction that would render a claim term superfluous because "[a] claim construction that gives meaning to all the terms of the claim is preferred over one that does not do so.")).

Nor would the written descriptions have allowed a POSA to ascribe any meaning to "fibrous." (*See* Defs. Pre. Brief at 19; Ex.19, Badylak Dec. ¶¶ 125-127). The term "fibrous" appears in the written descriptions when referring to the prior-art matrices that would be unsuccessful in the creation of functional organ tissue (*see generally* Ex.1, '193 patent, col.2

l.30–col.3 l.8; Ex.2, '830 patent, col.4 l.7–col.5 l.9; Ex.3, '417 patent, col.2 l.33–col.3 l.10), but also appears when referring to the scaffolds used for the preferred organ structure of the invention (*e.g.* Ex.2, '830 patent, col.6 ll.1-3; Ex.1, '193 patent, col.3 ll.55-56; Ex.3, '417 patent, col.3, ll.57-58). These contrasting disclosures would not have informed a POSA of a meaning for the term. But at least the written descriptions would have further confirmed to a POSA that "fibrous" cannot simply mean "composed of fibers," because such an interpretation would render some of the language in the written descriptions superfluous. (*See* Defs. Pre. Brief at 19; Ex.19, Badylak Dec. ¶ 123). For example, the '830 patent states that "the presently preferred structure for organ construction is a branched ***fibrous*** tree-like structure ***formed of polymer fibers***." (Ex.2, '830 patent, col.6 ll.1-3) (emphasis added).

The prosecution histories provide no further clarity. Rather, during prosecution applicants used the term "fibrous" to describe the *structure* and *shape* of the scaffolds in some instances and the *material* used to create the scaffolds in other instances. (*See* Defs. Pre. Brief at 19; Ex.19, Badylak Dec. ¶ 127; *see also* Ex.51, '018 PH 8/89 Resp., at SHR0018730). In particular, the applicants stated as follows:

> [I]t is believed that ***the meaning of a "fibrous structure" is clear from the specification to one skilled in the art***. There are several examples in the application and figures of a branched ***fibrous structure*** formed by unbraiding a portion of a braided, multifilament suture. Fiber meshes or sponge-like structures can also be formed by overlaying or entangling ***fibrous materials***.

(*Id.* at SHR0018730 (emphasis added)). A POSA reading these statements, which use the term in differing ways, would have gained no insight as to the meaning of "fibrous."

In addition, a POSA would not have been able to turn to one standard definition of "fibrous" in the relevant fields to assist in the determination. This is because one single definition did not exist. In fact, there were at least two adopted definitions for "fibrous" in

scientific/medical dictionaries and neither definition would have been appropriate. (*See* Defs. Reply Brief at 10; Ex.79, Badylak Reply Dec. ¶¶ 50-52).

In sum, the intrinsic evidence would not have informed a POSA of the meaning of "fibrous" with reasonable certainty, and therefore, the term is indefinite.

III. USE OF A PATENT SPECIFICATION TO LIMIT OTHERWISE BROAD CLAIM LANGUAGE

As per the Court's Order (ECF No. 119, ¶ 1b), Defendants address herein the standards for determining whether examples or statements contained in the patent specifications limit the scope of a claim and how they apply in the instant case. (*See also* Defs. Pre. Brief at 2).

A. Statements in the Summary of the Invention

The Summary of the Invention may sometimes limit the scope of the claims. Indeed, such limitation is reasonable given the purpose of the Summary of the Invention, which is to "be commensurate with the invention as claimed and any object recited should be that of the invention as claimed." 37 C.F.R. § 1.73. The Federal Circuit has repeatedly given claims a narrow interpretation based upon statements found in the Summary of the Invention. For example, in *Virnetx*, *Inc. v. Cisco Sys., Inc.*, 767 F.3d 1308 (Fed. Cir. 2014), the Federal Circuit placed heavy reliance on the Summary of the Invention to construe the claims, stating that "[t]he fact that the Summary of the Invention gives primacy to [certain] attributes strongly indicates" that those attributes are required aspects of the invention. *Id.* at 1318. Further, in *C.R. Bard, Inc. v. United States Surgical Corp.*, 388 F.3d 858 (Fed. Cir. 2004), the Court explained that "[a]lthough a statement's location [in the specification] is not 'determinative,' the location can signal the likelihood that the statement will support a limiting definition of a claim term." *Id*. at 864. In particular, because "[s]tatements that describe the invention as a whole . . . are more likely to support a limiting definition of a claim term" and "[s]tatements that describe the

invention as a whole are more likely to be found in certain sections of the specification, such as the Summary of the Invention[,]" statements in the Summary of the Invention can be particularly informative for claim-construction purposes. *Id.*

Additional Federal Circuit cases have likewise confirmed the importance of the Summary of the Invention for claim-construction purposes. *See, e.g.*, *Am. Calcar, Inc. v. Am. Honda Motor Co.*, 651 F.3d 1318, 1337 (Fed. Cir. 2011) (affirming narrow claim construction based upon the Summary of the Invention); *Microsoft Corp. v. Multi-Tech Sys., Inc.*, 357 F.3d 1340, 1348 (Fed. Cir. 2004) (noting that certain statements, "some of which are found in the 'Summary of the Invention' portion of the specification, are not limited to describing a preferred embodiment, but more broadly describe the overall inventions of all three patents"); *Elcommerce.com, Inc. v. SAP AG*, 745 F.3d 490, 499-500 (Fed. Cir. 2014), *opinion vacated by stipulation on other grounds*, 564 F. App'x 599 (Fed. Cir. 2014) (affirming the conclusion that "[t]he Summary of the Invention, which addresses the patent as a whole, makes clear that" the invention requires a certain limitation) (alteration in original); *Wireless Agents LLC v. Sony Ericsson Mobile Commc'ns AB*, 189 F. App'x 965, 967 (Fed. Cir. 2006) (nonprecedential) (noting that a statement in the patent was "not merely referring to a preferred embodiment; rather, as part of the 'Summary of the Invention,' it is 'commensurate with the invention as claimed'") (quoting 37 C.F.R. § 1.73).

B. Import of the Phrase "The Present Invention"

The Federal Circuit has repeatedly explained that statements in a patent that refer to "the present invention" as a whole should be construed as limiting the scope of the claims. For example, as noted in *Pacing Technologies LLC v. Garmin International Inc.*, No. 2014-1396, 2015 WL 668828 (Fed. Cir. Feb. 18, 2015), the Federal Circuit has found disavowal/disclaimer from language in the patent such as "the present invention includes" or "the present invention

is." 2015 WL 668828, at *3*; see also Fenner Invs., Ltd. v. Cellco P'ship*, No. 2013-1640, --- F.3d---, 2015 WL 570730, at *3 (Fed. Cir. Feb. 12, 2015) ("Describing the features of the 'present invention' as a whole . . . limits the scope of the invention.") (quoting *Verizon Servs. Corp. v. Vonage Holdings Corp.*, 503 F.3d 1295, 1308 (Fed. Cir. 2007)) (alterations omitted). In *Fenner*, the written description referred to "a block diagram of the present invention . . . ." 2015 WL 668828, at *3. Among other things, this statement, referring to a figure, led the Federal Circuit to give the claims at issue a narrow scope. *Id.*; *see also Microsoft*, 357 F.3d at 1348 (limiting the scope of the claims based upon, *inter alia*, the patent's discussion of "the present system").

C. The Use of Drawings/Figures to Determine the Scope of the Claims

Additionally, the drawings/figures in a patent can be useful for claim-construction purposes. For example, in *In re Katz Interactive Processing Patent Litigation*, 639 F.3d 1303 (Fed. Cir. 2011), the Federal Circuit adopted a narrow construction of the term "customer number" based, *inter alia*, upon the fact that "[a] figure in the specification shows 'customer number' and 'credit card number' as two distinct fields." 639 F.3d at 1325; *see also Gen. Protecht Grp., Inc. v. Int'l Trade Comm'n*, 619 F.3d 1303, 1310 (Fed. Cir. 2010) (using the figures in a patent in adopting a narrow claim construction).

D. Claim Construction Is Determined by Reviewing the Patent as a Whole

Although it may sometimes be difficult to determine "whether the patentee is setting out specific examples of the invention" or "instead intends for the claims and the embodiments in the specification to be strictly coextensive . . . . [t]he manner in which the patentee uses a term within the specification and claims usually will make the distinction apparent." *Phillips*, 415 F.3d at 1323. If the totality of the specification shows that the invention must have a limitation, the Federal Circuit has found that limitation to be a required aspect of the claims. *See,*

e.g., SkinMedica, Inc. v. Histogen Inc., 727 F.3d 1187, 1196 (Fed. Cir. 2013) ("Disclaiming the ordinary meaning of a claim term . . . can be affected [sic] through repeated and definitive remarks in the written description."); *Eon-Net LP v. Flagstar Corp.*, 653 F.3d 1314, 1321-23 (Fed. Cir. 2011) (adopting a narrow construction based upon the fact that the written description and drawings "repeatedly define[] the invention as a system for processing information originating from hard copy documents"); *Kinetic Concepts, Inc. v. Blue Sky Med. Grp., Inc.*, 554 F.3d 1010, 1019 (Fed. Cir. 2009) (construing the term "wound" narrowly where "[a]ll of the examples described in the specification involve skin wounds").

The Federal Circuit recently explained in *Enzo Biochem, Inc. v. Applera Corp.*, No. 2014-1321, ---F.3d---, 2015 U.S. App. LEXIS 4064 (Fed. Cir. Mar. 16, 2015), that for a disavowal/disclaimer to attach, the specification need not be completely devoid of broad language. There, the Federal Circuit reversed the district court's overly broad claim construction. In particular, the Federal Circuit concluded that even if one example in the specification supported a broader construction, this "does not override [the Federal Circuit's] analysis of the totality of the specification, which clearly indicates that the purpose of this invention was directed towards indirect detection, not direct detection." *Id.* at *18.

Notably, limiting the scope of a claim based on a patent specification does not require the specification to include an explicit disclaimer, but rather can be implicitly limited. *See Regeneron*, 2014 WL 6611510, at *11 (recognizing that disavowal of claim scope based upon the patent specification can be implicit) (citing *Astrazeneca AB v. Mut. Pharm. Co.*, 384 F.3d 1333, 1339-40 (Fed. Cir. 2004) ("Lexicography does not require rigid formalism such as "I define ____ to mean ____,"; the specification may define claim terms by implication.)). "[W]hen a patentee uses a claim term throughout the entire patent specification in a manner

consistent with only a single meaning, he has defined that term by implication." *Amazin' Raisins Int'l, Inc. v. Ocean Spray Cranberries, Inc.*, No. 04-12679-MLW, 2007 WL 2386360, at *8 (D. Mass. Aug. 20, 2007) (Wolf, C.J.) (internal quotation marks omitted).

E. Statements in the Specifications that Limit Otherwise Broad Claim Language in the Instant Case

1. "cells derived from a vascularized tissue"

Defendants' proposed construction for "cells derived from a vascularized tissue" is "parenchymal cells derived from a vascularized tissue or bone forming cells." Based upon multiple, clearly limiting statements in the specifications of the Patents in Suit, the proposed construction must include parenchymal cells.

The specifications of the Patents in Suit repeatedly underscore that the invention requires parenchymal cells. For example, in the '193 and '417 patents, the Summary of the Invention explains that "[t]he **present invention** is a technique whereby **functional cells** from a needed organ are grown on polymer scaffolding using cell culture techniques . . . ." (Ex.1, '193 patent, col.3 ll.34-39; Ex.3, '417 patent, col.3 ll.36-41) (emphasis added). A very similar statement appears in the Summary of the Invention of the '830 patent, but instead of "functional cells," it refers to "cells having a desired function." (Ex.2, '830 patent, col.5 ll.35-41). As the Patents in Suit make clear, the terms "functional cells" or "cells having a desired function" are synonymous with "parenchymal cells." (Ex.1, '193 patent, col.5 ll.56-60 ("[A]n advantage of the present method is that it provides a means for selective transplantation of **parenchymal cells which possess the necessary biologic function**, without transplantation of passenger leucocytes and antigen-presenting cells.") (emphasis added); Ex.3, '417 patent, col.5 ll.57-61; *see also* Ex.2, '830 patent, col.9 ll.14-18); Ex.19, Badylak Dec. ¶ 44).

The Summary of the Invention section of each of the Patents in Suit goes on to explicitly recite the use of parenchymal cells in the invention. Specifically, the '193 and '417 patents state that "[o]nce the structure is implanted and vascularization takes place, the resulting organoid is a true chimera formed of **parenchymal elements of the donated tissue** and vascular and matrix elements of the host." (Ex.1, '193 patent, col.3 ll.43-46; Ex.3, '417 patent, col.3 ll.45-48) (emphasis added). Again, the Summary of the Invention in the '830 patent contains a nearly identical statement referring to the use of "parenchymal elements of the donated tissue" in the method of the present invention. (Ex.2, '830 patent, col.5 ll.47-50). Given these prominent statements in the Summary of the Invention discussing "the present invention" as a whole, applicants unmistakably showed that with respect to cells, their invention was limited to parenchymal cells (i.e., functional cells or cells having the desired function).

There is nothing in the specifications to suggest that parenchymal cells referenced in the Summary of the Invention are only an embodiment of a broader scope of cells. *See Silicon Graphics, Inc. v. ATI Techs., Inc.*, 607 F.3d 784, 791-92 (Fed. Cir. 2010) (affirming a narrow construction based upon the Summary of the Invention despite broad general language in the specification, where "[n]othing else in the specification indicates that the statement in the Summary of the Invention was merely an embodiment of the present invention"). To the contrary, similar statements throughout the specifications of the Patents in Suit, often discussing the invention as a whole, make clear applicants' intent to limit the claims to require the inclusion of parenchymal cells. For example:

- "The configuration of the polymer scaffold must have enough surface area for the cells to be nourished by diffusion until new blood vessels interdigitate with the

implanted parenchymal elements to continue to support their growth, organization, and function." (Ex.2, '830 patent, col.11 ll.9-12) (emphasis added).

- "In distinct contrast to the prior art, ***the present method for controlled implantation of functional cells*** into patients using polymers as temporary scaffolding produces an organ which is vascularized in vivo to allow growth of the cells in a three-dimensional configuration similar to that of the organ whose function they are replacing." (Ex.1, '193 patent, col.6 ll.13-18 (emphasis added); *see also* Ex. 2, '830 patent, col.9 l.66-col.10 l.2).
- "***The present invention*** decreases this possibility [of 'graft vs. host' disease] since ***only the cells needed for function*** are placed on the polymers and implanted into the patient." (Ex.1, '193 patent, col.8 ll.44-46 (emphasis added); *see also* Ex.3, '417 patent, col.8 ll.50-52).

The consistent description in the specifications of the cells as "parenchymal cells" or "functional cells," including the statements made in the Summary of the Invention, unequivocally show the limited scope of the claims. This disclaimer is further emphasized by the frequent use of the limiting phrase "the present invention" when describing the cells; this type of disclaimer is illustrated by the Federal Circuit's recent decision in *Pacing Technologies*, where the Court noted its previous findings of disavowal/disclaimer based on language such as "the present invention includes" or "the present invention is." 2015 WL 668828, at *3.

In addition to all of the disclosures above identifying the parenchymal cells as the cells of the invention, particularly noteworthy is Figure 1 of the '830 patent. This figure is described in the text of the '830 patent by the following language: "Fig. 1 is a schematic of ***the process of the present invention*** to produce a chimeric organ, in this diagram, a liver, pancreas or intestine: (1)

the appropriate parenchymal cells are harvested, dispersed, and seeded onto the polymer matrix in cell culture . . . ." (Ex.2, '830 patent, col.6 l.65-col.7 l.2) (emphasis added). Consistent with this text is the language embedded within Figure 1, which lists one of the steps of the process as "[h]arvest ***parenchymal cells***." (Ex.2, '830 patent, Fig.1) (emphasis added). Of particular relevance is that Figure 1 is not referencing any specific example in the '830 patent. Nor is Figure 1 describing a particular embodiment of the invention. Figure 1, and the corresponding text describing Figure 1, are identifying a feature of the present invention, namely the cells, as a whole, and limiting this feature to parenchymal cells. *See Fenner,* 2015 WL 570730, at *3 (finding that a description of a diagram as being "of the present invention" evidenced a limiting scope of the claims); *see also In re Katz*, 639 F.3d at 1325 (adopting a narrow construction of a claim term based on a figure).

In sum, throughout the specifications of the Patents in Suit, including in the Summary of the Invention and in the figure that diagrammatically represents the invention, applicants consistently referred to parenchymal cells (i.e., functional cells) as the cells of the present invention. This language was not limited to specific examples or particular embodiments. As such, this Court should conclude that because the Patents in Suit use the claim term "cells" "throughout the entire patent specification in a manner consistent with only a single meaning, [they have] defined that term by implication[,]" namely as parenchymal cells. *See Amazin' Raisins Int'l, Inc.,* 2007 WL 2386360, at *8.

Finally, because applicants suggested during prosecution that they did not consider bone forming cells to be parenchymal cells, yet ultimately recited bone forming cells in some of the dependent claims of the Patents in Suit (Ex.2, '830 patent, claim 14; Ex.1, '193 patent, claim 11; Ex. 3, '417 patent, claim 20), the claims should be construed to include bone forming cells.

(Defs. Pre. Brief at 11; Ex.19, Badylak Dec. ¶¶ 48-51). For these reasons, "cells derived from a vascularized tissue" should be construed as "parenchymal cells derived from a vascularized tissue or bone forming cells."

2. "mass of cells"

Consistent with Federal Circuit jurisprudence, to avoid a construction that would clearly render the claims of all three Patents in Suit invalid, the term "mass of cells" should be defined by the one place in the written description that arguably provides support for the term.

The term "mass of cells" appears in the independent claims of all three Patents in Suit. For example, the '830 patent includes the phrase "the maximum distance over which diffusion of nutrients and gases must occur through a ***mass of cells*** attached to the fibers is between 100 and 300[3] microns." (Ex.2, '830 patent, claim 1) (emphasis added). The only place the term "mass of cells" appears in the written descriptions is in the Abstracts, which did not contain the term until the claims were finalized, and therefore cannot be used as support for the term "mass of cells." (*Compare*, Ex.58, '193 PH Spec. as Filed, SHR0000071 *with* Ex.59, '830 PH Notice of Allowability, SHR0005593); *see also Ariad Pharms., Inc. v. Eli Lilly & Co.*, 598 F.3d 1336, 1355 (Fed. Cir. 2010) (en banc) ("written description is determined as of the filing date . . . ."). Thus, the sole guidance in the written descriptions as filed as to the meaning of this term comes from language that tracks the claim, wherein the phrase "densely packed cells" is used instead of "mass of cells" (i.e., "The maximum distance over which adequate diffusion through *densely packed cells* can occur appears to be in the range of approximately 100 to 300 microns . . . .").

[3] For simplicity, the '830 patent claim is used as exemplary of the independent claim of all three Patents in Suit. The relevant claim language in the '193 and '417 patents differs only in that the maximum diffusion distance is "between 200 and 300 microns." (Ex.1, '193 patent, claim 1; Ex.3, '417 patent, claim 1).

(Ex.2, '830 patent, col.10 ll.12-20; *see also* Ex.1, '193 patent, col.6 ll.27-31; Ex.3, '417 patent, col.6 ll.28-33).

This single disclosure in the specifications properly limits the claim scope based on the principle that "claims are generally construed so as to sustain their validity, if possible." *Whittaker Corp. v. UNR Indus., Inc.*, 911 F.2d 709, 712 (Fed. Cir. 1990) (citing *ACS Hosp. Sys., Inc. v. Motefiore Hosp.*, 732 F.2d 1572, 1577 (Fed. Cir. 1984)). This principle is aptly illustrated by the Federal Circuit's recent decision in *Bayer Cropscience AG v. Dow Agrosciences LLC*, 728 F.3d 1324 (Fed. Cir. 2013). There, the Federal Circuit rejected the patentee's arguments in support of a broad construction because, *inter alia*, such a broad construction "would call into serious doubt the claim's validity [as meeting the written-description requirement] under 35 U.S.C. § 112(a)." 728 F.3d at 1330-31. Here, as discussed above, the phrase "mass of cells" appears nowhere in the patent applications as filed. Simply put, if "mass of cells" is not construed as "densely packed cells," it "would call into serious doubt the [claims'] validity" under the written-description requirement, given that the only arguable support for the term "mass of cells" is the patents' disclosure of "densely packed cells." *Bayer Cropscience*, 728 F.3d at 1330. For these reasons, the Court should adopt Defendants' proposed construction.

3. "proliferating"

The specifications of the Patents in Suit make clear that the term "proliferating" requires proliferation in vivo. For example, the '830 patent states as follows:

> ***The present invention is*** a method to provide functional organ equivalents using bioabsorbable artificial substrates as temporary scaffolding for cellular transfer and implantation. The success of the method depends on the integration of the following principles: . . . .
>
> 4. Cell shape is determined by cytoskeletal components and attachment to matrix plays an important role in cell division and differentiated function. If dissociated cells are placed into mature

> tissue as a suspension without cell attachment, they may have a difficult time finding attachment sites, achieving polarity, and functioning because they begin without intrinsic organization. ***This limits the total number of implanted cells which can remain viable to organize, proliferate, and function.***

(Ex.2, '830 patent, col.8 ll.36-40, 54-62) (emphasis added). A POSA would have understood that proliferation of "implanted cells" means that cells are proliferating in vivo. And because these statements are directed to "[t]he present invention" as a whole, they serve to limit the scope of the invention. *See, e.g., Pacing Techs.*, 2015 WL 668828, at *3.

Immediately following the above-quoted excerpts, the Patents in Suit further describe the present invention by stating that:

> The latter principle is a key point in the configuration of the support matrices. For an organ to be constructed in tissue culture and subsequently successfully implanted, the matrices must have sufficient surface area and exposure to nutrients such that cellular growth and differentiation can occur prior to the ingrowth of blood vessels following implantation. ***After implantation, the configuration must allow for diffusion of nutrients and waste products and for continued blood vessel ingrowth as cell proliferation occurs.***

(Ex.2, '830 patent, col.8 l.63-col.9 l.4; *see also* Ex.1, '193 patent, col.5 ll.38-46, Ex.3, '417 patent, col.5 ll.38-46) (emphasis added). A POSA would have recognized that proliferation occurring "after implantation" means that the cells are proliferating in vivo. Again, these statements are directed to the invention as a whole, not merely to a preferred embodiment or particular example.

Accordingly, the statements limit the scope of the invention to require proliferation in vivo. And as detailed in Defendants initial claim-construction briefing (Defs. Pre. Brief at 17-18; Ex.19, Badylak Dec. ¶¶ 98, 100-101, Appendix G), the prosecution histories demonstrated that such proliferation must be "to a moderate degree." Therefore, "proliferating" should be construed as "proliferating in vivo, to a moderate degree."

4. "functional"

Because of numerous, limiting statements in the specifications of the Patents in Suit, the definition of "functional" must include "replacing or supplementing lost specific organ function."

The specifications of the Patents in Suit state: "The present invention is a method to provide **functional** organ equivalents . . . ." (Ex.1, '193 patent, col.5 ll.18-19; Ex.2, '830 patent, col.8 ll.36-37; Ex.3, '417 patent, col.5 ll.20-21) (emphasis added). After laying out the principles underlying the method of the invention, the specifications continue to describe the invention as a whole by stating that "[t]his method for **replacing or supplementing lost organ function** has a number of advantages [.]" (Ex.1, '193 patent, col.5 ll.47-48; Ex.2, '830 patent, col.9 ll.5-6; Ex.3, '417 patent, col.5 ll.48-49) (emphasis added). Thus, because these statements describe the invention as a whole, the specifications clearly demonstrate that the term "functional" requires the replacement or supplementation of function that is lost in an organ. *See, e.g., Pacing Techs.*, 2015 WL 668828, at *3.

The specifications elaborate on the meaning of "functional" in the following excerpt:

> The ***criteria for successful growth and implantation*** is when the transplant demonstrates ***functional equivalency to the organ which it is replacing or supplementing***. For example, a ***functional*** kidney would not necessarily have to manufacture renin as long as it functions as an effective dialysis apparatus, removing concentrated low molecular weight materials from the bloodstream. A ***functional*** liver may only need to produce protein such as coagulation factors and excrete bile. For this purpose the liver transplant could be implanted in the omentum, the fatty, highly vasculated membrane adjacent to the small intestine. A ***functional*** intestine should be able to absorb sufficient nutrients to sustain life. This could be in the form of caloric solutions rather than normal "foodstuffs".

(Ex.1, '193 patent, col.8 ll.53-66; Ex.2, '830 patent, col.22 ll.23-37; Ex.3, '417 patent, col.8 l.59–col.9 l.5) (emphasis added). In reading this excerpt, a POSA would have understood that in

addition to replacing or supplementing lost organ function, the term "functional" is being used to describe engineered constructs that perform *a function specific to the organ* that the constructs are replacing or supplementing. This excerpt is discussing the criteria of the invention as a whole, and thus, describes a required aspect of the claimed invention.

In addition, as detailed in Defendants initial claim-construction briefing (Defs. Pre. Brief at 12-13; Ex.19, Badylak Dec. ¶¶ 60-63, Appendix E), the prosecution histories demonstrate that the lost specific organ function being replaced or supplemented "is specific to a particular organ and not shared by other organs." Therefore, "functional" should be construed as "replacing or supplementing lost specific organ function that is specific to a particular organ and not shared by other organs."

IV. THE USE OF EXPERT TESTIMONY IN CLAIM-CONSTRUCTION PROCEEDINGS

As per the Court's Order (ECF No. 119, ¶ 1c), Defendants address herein whether the Court should hear expert testimony at the *Markman* hearing, and the implications, if any, of *Teva Pharms. USA, Inc. v. Sandoz, Inc.*, 135 S. Ct. 831 (2015).

A. The Law Concerning Expert Testimony in Claim-Construction Proceedings

When construing claims, the intrinsic record is the primary resource. *See Phillips*, 415 F.3d at 1312. It is appropriate, however, for a court to consider extrinsic evidence, "including expert and inventor testimony, dictionaries, and learned treatises." *Id*. at 1317 (Fed. Cir. 2005) (citing *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 980 (Fed. Cir. 1995), *aff'd*, 517 U.S. 370 (1996)). This is especially true when "a patent [is] so interspersed with technical terms and terms of art that the testimony of scientific witnesses is indispensable to a correct understanding of its meaning." *Teva*, 135 S. Ct. at 841 (quoting *Seymour v. Osborne*, 11 Wall. 516, 546 (1871)). And while extrinsic evidence is generally viewed as less reliable than the

intrinsic record, it "can help educate the court regarding the field of the invention and can help the court determine what a person of ordinary skill in the art would understand claim terms to mean" as long as the court weighs all of the evidence and accounts for any shortcomings of extrinsic evidence. *Phillips*, 415 F.3d at 1319. Put another way, extrinsic evidence is likely to be a reliable claim-construction source only when "considered in the context of the intrinsic evidence." *Id*.

A court has discretion to hear expert testimony during claim-construction proceedings. *See Markman*, 52 F.3d 967 at 983; *see also Inpro II Licensing, S.A.R.L. v. T-Mobile USA, Inc.*, 450 F.3d 1350, 1357 (Fed. Cir. 2006). Notably, expert testimony may be particularly insightful in claim construction where intrinsic evidence does not supply the answer. *See Key Pharms. v. Hercon Labs. Corp.*, 161 F.3d 709, 716 (Fed. Cir. 1998).

B. The Supreme Court's Recent Decision in *Teva* Regarding Appellate Review of a District Court's Claim-Construction Determination

The Supreme Court recently reiterated that claim-construction disputes sometimes require the resolution of subsidiary factual disputes. *Teva*, 135 S. Ct. at 837 (noting that "in patent construction, subsidiary factfinding is sometimes necessary."). To the extent that a district court resolves such a factual dispute based upon extrinsic evidence (i.e., evidence outside the patents or prosecution histories, such as expert testimony), these findings would be entitled to clear-error review on appeal, as opposed to the *de novo* standard of review that applies to the Court's analysis of the intrinsic record. *Id*. at 841.

In sum, the *Teva* decision by the Supreme Court confirmed the value of experts in a technically complex claim-construction proceeding, *id.*, but did not, in any significant way, alter how expert testimony is used in a *Markman* hearing.

C. Expert Testimony Regarding Claim Construction Would Be Beneficial to the Court in the Instant Case

At the time of the inventions, the field of tissue engineering was in its infancy (*see* Ex.19, Badylak Dec. ¶ 109), as further evidenced by Plaintiffs' representation that the Patents in Suit "are recognized as pioneering patents in the field of artificial tissue generation" that describe "ground-breaking technology." (Plaintiffs' Opening Brief at 1). A POSA would understand, from reading the Patents in Suit, that the ultimate goal of the invention was to create thick organs that replaced or supplemented lost organ function in vivo. (*See* Ex.19, Badylak Dec. ¶ 30). It follows that the level of ordinary skill is high, as is further demonstrated by the backgrounds and expertise of the inventors, Drs. Vacanti and Langer. (*See* Plaintiffs' Opening Brief at 1-3). In particular, a POSA would have had (1) a Ph.D. or an equivalent degree in cell biology, biomedical engineering, or a related discipline, having a research focus in the areas of cell/tissue growth, biomaterials, and/or reconstructive surgery, with three to five years of practical experience; or (2) a D.V.M. or M.D., having a research focus in cell/tissue growth, biomaterials, and/or reconstructive surgery, with three to five years of practical experience in these areas. (*See* Ex.19, Badylak Dec. ¶¶ 19-21). Moreover, artificial tissue generation falls within the field of biotechnology, which the Federal Circuit recognizes is an "unpredictable art." *In re Kubin*, 561 F.3d 1351, 1360 (Fed. Cir. 2009) (referring to "the unpredictable art of biotechnology").

Because an understanding of the scientific principles at issue would assist the Court in construing the claims of the Patents in Suit, admission of expert testimony is appropriate. *See* Fed. R. Evid. 702(a) (allowing for the admission of expert testimony where, *inter alia*, such testimony would assist in understanding the evidence or determining a fact in issue). And this is especially true given the specialized knowledge that is necessary to fully understand the technology of the Patents in Suit. Accordingly, it is "most sensible" to allow expert testimony at

the *Markman* hearing "and decide then what use, if any, to make" of such testimony. *Zest IP Holdings, LLC v. Implant Direct Mfg., LLC*, No. 10cv0541-LAB, 2012 WL 92341, at *1 (S.D. Cal. Jan. 11, 2012).

In support of Defendants' claim-construction positions, Dr. Badylak has submitted an opening declaration (Ex.19) and reply declaration (Ex.79) on which Defendants rely. He is a tenured professor in the Department of Surgery at the University of Pittsburgh Medical Center and in the Department of Bioengineering at the Swanson School of Engineering at the University of Pittsburgh. (*See* Ex.19, Badylak Dec. ¶ 5). He is also the current Director of the McGowan Center for Preclinical Studies and the Deputy Director of the McGowan Institute for Regenerative Medicine. (*See id*.). Dr. Badylak received his Doctorate of Veterinary Medicine (D.V.M.) in 1976 and his Doctorate of Philosophy (Ph.D.) in Anatomic Pathology in 1981, both from Purdue University. (*See id*. ¶ 6). Subsequently, he received his medical degree (M.D.) with highest honors from Indiana University Medical School in 1985. (*See id*.).

Dr. Badylak's academic research career, which began in 1983 and continues through the present, has been in the fields of tissue engineering and regenerative medicine. (*See id*. ¶¶ 7-9). Thus, at the time of the inventions, Dr. Badylak was already immersed in these disciplines. He is highly published and distinguished in these fields in which he has taught, mentored, and researched for more than 30 years. (*See id*. ¶¶ 10-14). His decades of first-hand knowledge and practical experience regarding the technology relevant to the Patents in Suit allow him to speak directly as to how a POSA would have interpreted the claims of the Patents in Suit in the 1980s.

In the instant case, expert testimony would be especially helpful for construction of several of the terms at issue. For example, Dr. Badylak's testimony will be useful to the Court's determination of indefiniteness with respect to the terms "three-dimensional" and "fibrous."

Given the Supreme Court's decision in *Nautilus*, expert testimony "may have increased significance in claim construction [proceedings] in order to illuminate the 'reasonable certainty' standard . . . ." *Mycone Dental Supply Co. v. Creative Nail Design, Inc.*, No. 11-4380, 2014 WL 3362364, at *4 (D.N.J. July 9, 2014). Because a court's ability to assign *some* meaning to a claim term is no longer sufficient to save the claim from indefiniteness, expert testimony can be helpful to determine whether the claims would inform a POSA with reasonable certainty about the scope of the invention. *See id.* at *3.

With respect to the term "three-dimensional," Dr. Badylak explains the state of the art at the time of the invention. (*See* Ex.19, Badylak Dec. ¶ 109). He also explains how a POSA would have understood dimensionality of scaffolds in the prior-art and state-of-the-art patents relevant to this claim-construction inquiry. (*See id*. ¶¶ 112-144; *see also* Ex.79, Badylak Reply Dec. ¶ 11). As for the term "fibrous," Dr. Badylak identifies the standard definitions of "fibrous" at the time of the invention, and explains why neither of these definitions can be applied to the term "fibrous" in the Patents in Suit. (*See* Ex.79, Badylak Reply Dec. ¶¶ 50-52). Additionally, Dr. Badylak analyzes the intrinsic record in detail and explains why a POSA, having considered that evidence, would not have understood with reasonable certainty the meaning of the terms "three-dimensional" and "fibrous." This analysis—conducted through the lens of a POSA—is invaluable to the indefiniteness determination.

Dr. Badylak's analysis regarding other claim terms, for example "mass of cells," "cells derived from a vascularized tissue," and "proliferating," would also be useful for the Court during claim construction. Some of the reasons to hear Dr. Badylak testify at the *Markman* hearing as to these terms are outlined herein. For instance, concerning the term "mass of cells," Dr. Badylak explains how a POSA would have understood this phrase at the time of the

invention. (*See* Ex.19, Badylak Dec. ¶ 87; *see also* Ex.79, Badylak Reply Dec. ¶ 20). Against this understanding, he outlines why (1) the construction for "mass of cells" as "densely packed cells" is consistent with the purpose of the invention and (2) Plaintiffs' definition for this term would obviate the need for the invention. (*See* Ex.79, Badylak Reply Dec. ¶ 21). This analysis is particularly useful given that the term "mass of cells" does not appear anywhere in the specifications as of the filing dates of the Patents in Suit. (*See id*. ¶ 22). As for the term "cells derived from a vascularized tissue," Dr. Badylak provides the perspective of a POSA on at least two key points, namely (1) the difference between parenchyma and stroma (*see, e.g.*, Ex.79, Badylak Reply Dec. ¶ 41), and (2) why a POSA would understand that the Patents in Suit use the phrases "parenchymal cells" and "functional cells" interchangeably (*see* Ex.19, Badylak Dec. ¶ 44). Regarding the term "proliferating," Dr. Badylak explains the difference between growth and proliferation as understood by the medical community (*see, e.g.*, Ex.79, Badylak Reply Dec. ¶¶ 60-63), and why a POSA would understand proliferation in vivo to be required for the invention to be successful (*see* Ex.19, Badylak Dec. ¶ 95).

V. CONCLUSION

For at least the reasons expressed above, Defendants respectfully request that the Court (1) decide the indefiniteness issue with respect to the claim terms "three-dimensional" and "fibrous" in connection with the *Markman* hearing; (2) apply the standards that allow patent specifications to limit the scope of the claims with respect to at the least the claim terms "cells derived from a vascularized tissue," "mass of cells," "proliferating," and "functional;" and (3) hear expert testimony from Dr. Stephen F. Badylak at the *Markman* hearing.

Respectfully submitted,

Dated: March 25, 2015 By: /s/ Sandra Kuzmich, Ph.D.

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CERTIFICATE OF SERVICE

I, Jonathan A. Herstoff, hereby certify that this document filed through the CM/ECF system will be sent electronically to the registered participants as identified on the NEF and paper copies will be sent to those indicated as non-registered participants on March 25, 2015.

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